Electric lines would be installed to connect the turbines and strings (see Figure 2.1-2). Lines connecting individual turbines in each string would be located underground, and lines connecting the strings would be either underground or overhead.

The initial stage of the project would be connected through the project's western substation to BPA's existing Big Eddy-Midway 230-kilovolt (kV) transmission line that crosses the northwest portion of the study area. The most likely interconnection option for subsequent stages (and the option analyzed in this EIS) would be to build a new 4-mile 230-kV transmission line from a second substation in the eastern portion of the project site (see Figure 2.1-2) to interconnect with BPA's Big Eddy-Midway 230-kV transmission line. Other options for interconnecting subsequent stages are discussed briefly in Section 2.1.2.2.

Construction of the project could begin in summer 2002, with at least partial power generation expected as early as winter 2002-2003. The project could potentially be developed in multiple phases. Because it is not certain if subsequent phases of the project (after the initial 50-aMW project is built) would be developed, it would be speculative at this time to provide an estimated schedule for these subsequent phases. However, if the full project were to be built all at once, it would take approximately 9 months to construct.

2.1.2 Facilities

The project would be located primarily on privately-owned agricultural land pursuant to leases negotiated between the landowners and the project developer. These leases would allow construction and operation of wind facilities for a negotiated term. In exchange, each landowner would receive financial compensation. Landowners could continue their ranching and farm operations around the wind turbines and other facilities. The project developer has several leases already signed with landowners. All landowners in the study area have agreed to allow environmental studies to take place on their land.

The project would consist of wind turbines, associated electrical systems, meteorological towers, access roads, and operation and maintenance buildings (see Figure 2.1-2). Each wind turbine in a string would be connected by underground electrical lines. Between strings, power would be collected by underground or overhead lines that would connect to the project substations. The following subsections provide more information about project facilities. Tables 2.1-1 and 2.1-2 summarize the proposed project facilities and the total area that would be permanently and temporarily occupied by each project facility.

TABLE 2.1-1
Area Permanently Occupied by Maiden Wind Farm Facilities

Proposed Facility	Number of Facilities	Square Feet per Unit	Total Acres
Turbine Pads/Towers[1]	549	2,500	31
Access Roads[2]			
Existing improved roads	10.3 miles	158,400 per mile of road	37
New roads	44.5 miles	158,400 per mile of road	161
Overhead Collector Line[3] Structures	120	30	<0.1
Transmission Line Structures[3]	26	30	<0.1
Substation Sites	2	174,240	8
Operation and maintenance Buildings	3	174,240	12
Meteorological Towers	4	24,025	2.2
Total Permanently Occupied Area			**251**

Notes:
1. Area of foundations, transformer, and cleared area for each tower is 50 feet by 50 feet, excluding access road.
2. Assumes 20 feet of travel lanes and up to 5 additional feet for each shoulder.
3. Occupied area around each pole.

The total acres occupied could be less than shown above because some project facilities overlap. For example, because underground cable lines and overhead power lines would overlap roadway shoulders to some degree, the area to be occupied would be less than the total acreage of these three facilities.

TABLE 2.1-2
Area Temporarily Occupied by Maiden Wind Farm Facilities During Construction

Proposed Facility	Number of Facilities	Square Feet per Unit	Approximate Total Acres
Turbine Construction/Laydown Areas			
Main staging areas	2	435,600	20
Intermediate staging areas	14	87,120	28
Laydown areas at each turbine site[1]	549	62,500	788
Turnaround areas at each turbine string[2]	30	32,400	22
Meteorological towers	4	10,000	1
Roads			
Temporarily disturbed area during road construction[3]	54.8 miles	105,600 per mile of road	133
Quarries	2	348,480	16
Electrical System Laydown Areas			
Laydown areas for overhead transmission structures	26	10,000	6
Laydown areas for overhead collector structures	120	10,000	28
Conductor stringing site	3	40,000	3
Underground collector cable area	30 miles	26,400 per mile of road	18
Total Temporarily Occupied Area*			**1,063**

Notes:
1. Assumes 250 by 250-foot area for each tower.
2. Assumes 180 by 180-foot turnaround area for each turbine string.
3. Assumes 10 feet on each side of 30-foot roadway.
* Does not include area to be occupied by permanent facilities.

The total acres occupied by temporary facilities could be less than shown above because some facilities would overlap. For example, because laydown areas for collector structures would likely overlap laydown areas for turbine sites to some degree, the area to be occupied would be less than the total acreage of these two facilities.

2.1.2.1 Wind Turbines

The project developer would select a single wind turbine design from a range of turbines that produce 900-kilowatt (kW) to 2,000-kW output each. The height of the turbines could range from about 300 feet to 390 feet (depending on the final turbine type selected) as measured with a rotor blade in the vertical position. Larger wind turbines produce more kilowatts. Consequently, if 2,000-kW turbines (390 feet high) were used, 247 turbines would be constructed instead of 549 turbines using 900-kW turbines. The wind turbines would be grouped in strings of 5 to 100 turbines, each spaced approximately 250 to 450 feet from the next (about 1.5 times the rotor diameter). Approximately 30 miles of turbine strings would be constructed at full build-out using 900-kW turbines.

The project developer is considering six different wind turbine sizes for the project. Figure 2.1-3, as an example, shows the configuration of an NEG Micon 900/52 900-kW wind turbine and tower. Figure 2.1-4 is a photograph of the type of turbine that would likely be used. Other types of wind turbines are of similar appearance but tower height and rotor diameters may differ. Table 2.1-3 lists the kW output of various turbines, the maximum height (with a rotor blade in the vertical position), and the number of turbines that would be needed for a 200-MW and 494-MW project.

TABLE 2.1-3
Wind Turbine Sizes Considered for Maiden Wind Farm

kW Output	Maximum Height	Quantity for 200-MW Project	Quantity for 494-MW Project
900	322	222	549
1,000	298	200	494
1,300	299	154	380
1,500	389	133	330
1,800	351	111	275
2,000	387	100	247

The turbine type likely to be used is an upwind, dual-speed turbine (i.e., the nacelle would move so that the rotor always faces upwind and turns at one of two speeds, depending on the current wind speed). The typical range of wind speeds for these turbines to operate is 9 to 56 miles per hour (mph). At higher speeds the turbines automatically stop to avoid damage, and remain stationary until the wind slows. The turbines are designed to withstand wind speeds of up to about 119 mph.

Wind turbines consist of the foundation, tower, nacelle, and rotor (hub and three rotor blades). The nacelle is mounted at the top of the tower and houses the gearbox and generator. The rotor attaches to the nacelle.

The newer-generation wind turbines have rotors that make one revolution approximately every 3-4 seconds (15-20 rotations per minute), which increases the blade visibility to birds compared to the old, faster-moving turbine models. Newer turbine models also use tubular towers instead of lattice towers to eliminate perching opportunities for birds.

Foundations.

Foundations most likely would be caisson-type but potentially could be a spread footing-type. The type of foundation would be determined based on site geotechnical study information after construction bids are received and evaluated. Foundations would be designed in accordance with state and county building requirements and standard engineering practice. Caisson-type footings require the excavation of a hole up to 30 feet deep and up to 16 feet in diameter. A circular corrugated metal form about 13 feet in diameter would be inserted in the hole, and another circular corrugated metal form several feet smaller in diameter would be inserted inside the larger form. The space between the two forms would be filled with reinforced concrete, and the space inside the inner concrete form would be filled with compacted backfill and/or slurry. Anchor bolts extending from the depth of the concrete footing and protruding about 9 inches above the concrete would be used to attach the towers.

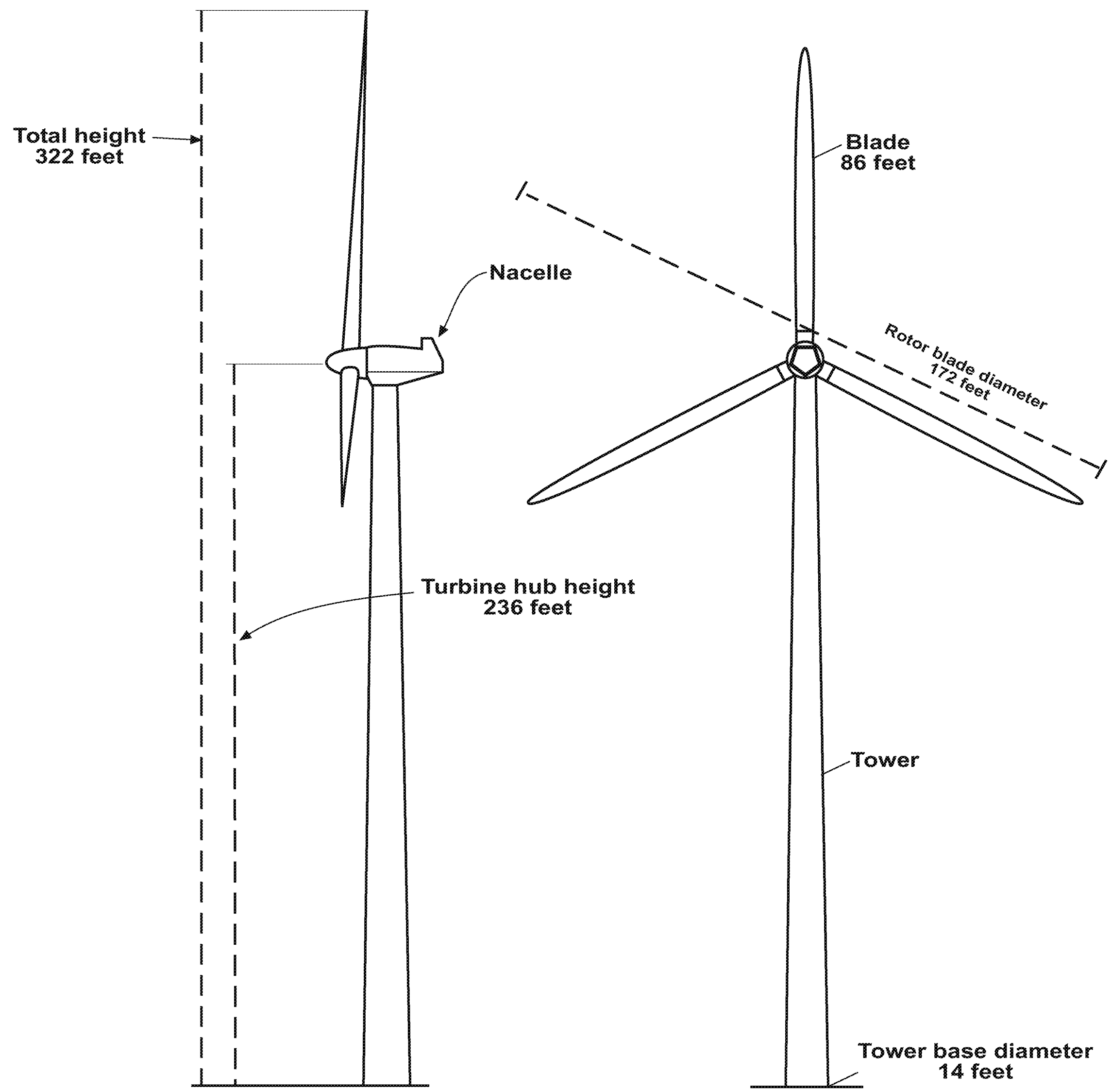

FIGURE 2.1-3
Representative 900-kW Wind Turbine
MAIDEN WIND FARM EIS

CH2MHILL